

Public Markets for Vaccines

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BILL & MELINDA
GATES *foundation*

Overview

1. Bill & Melinda Gates Foundation – Overview of Global Health Program & Vaccine Delivery

- Global Health priorities
- Portfolio of investments
- Importance of partnerships

2. What have we learned about access to vaccines in public markets?

- Markets overview
- Chinese vaccine market

3. What are the future challenges and how can we meet them?

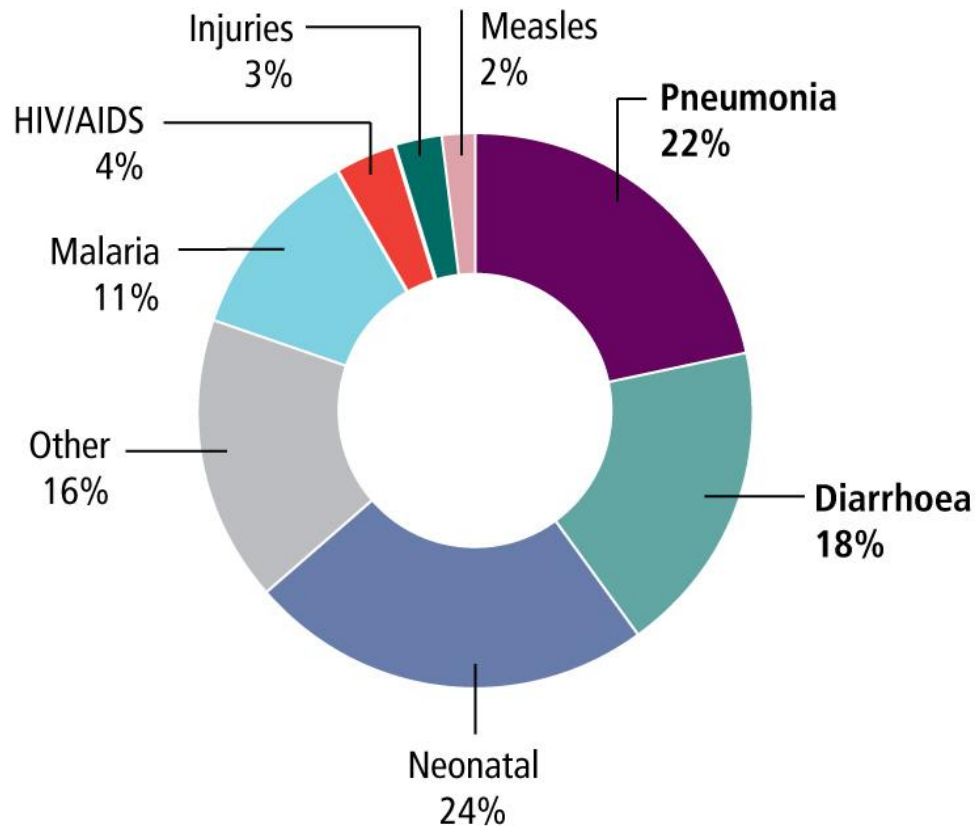
- Tiered pricing as a component of access strategies
- The future
- Decade of Vaccines



Global Health Mission

To ensure that technology-based health solutions are developed and delivered to those most in need.

Causes of Under-5 Mortality in Low-Income Countries



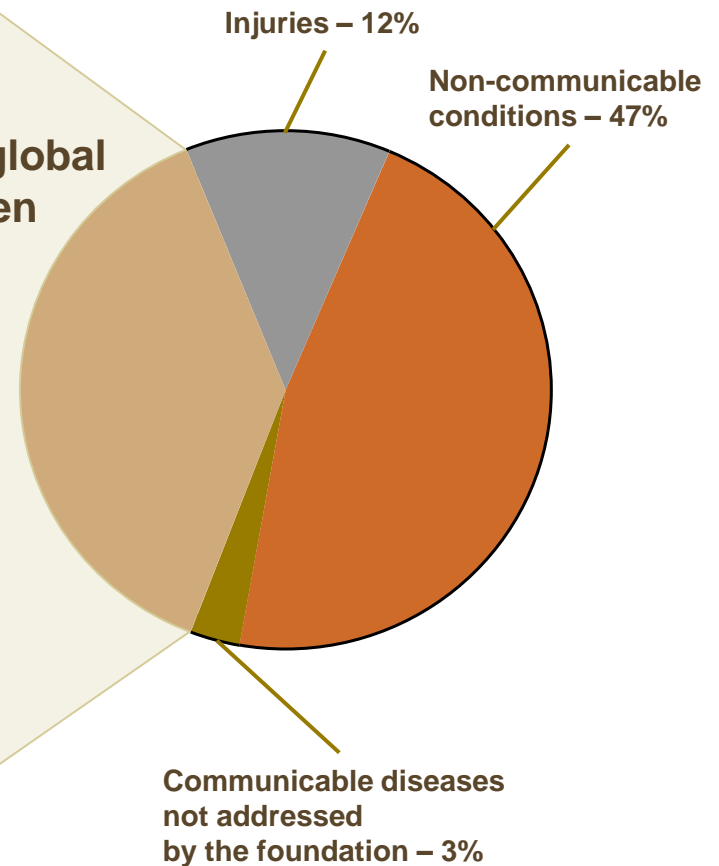
Priorities in Global Health

Our Areas of Focus


- **Infectious Diseases**
 - Malaria
 - Tuberculosis
 - Diarrheal Illness
 - Pneumonia
- **HIV/AIDS**
- **Family Health**
 - Nutrition
 - Maternal, neonatal, child
 - Family planning
- **Vaccine Preventable Diseases (e.g. Polio)**

38% of the global health burden

Global Health Burden



Foundation global health grant commitments and disbursements, 1994–2009

Year	Commitments	Disbursements
1995	\$ 1,750,000	\$ 583,000
1996	\$ 0	\$ 583,000
1997	\$ 2 MM	\$ 1.3 MM
1998	\$ 153 MM	\$ 17 MM
 1999	\$ 1.2 BN	\$ 371 MM
2000	\$ 684 MM	\$ 554 MM
2001	\$ 540 MM	\$ 845 MM
2002	\$ 519 MM	\$ 502 MM
2003	\$ 705 MM	\$ 569 MM
2004	\$ 955 MM	\$ 430 MM
2005	\$ 1.15 BN	\$ 833 MM
2006	\$ 1.77 BN	\$ 894 MM
2007	\$ 1.90 BN	\$ 1.20 BN
2008	\$ 1.96 BN	\$ 1.82 BN
2009	\$ 1.5 BN	\$ 1.83 BN
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Total	\$ 13 BN	\$ 9.9 BN

**Targeted investments
& focus on results**

Gates Foundation grant commitments by global health program area (1994-2009 commitments)

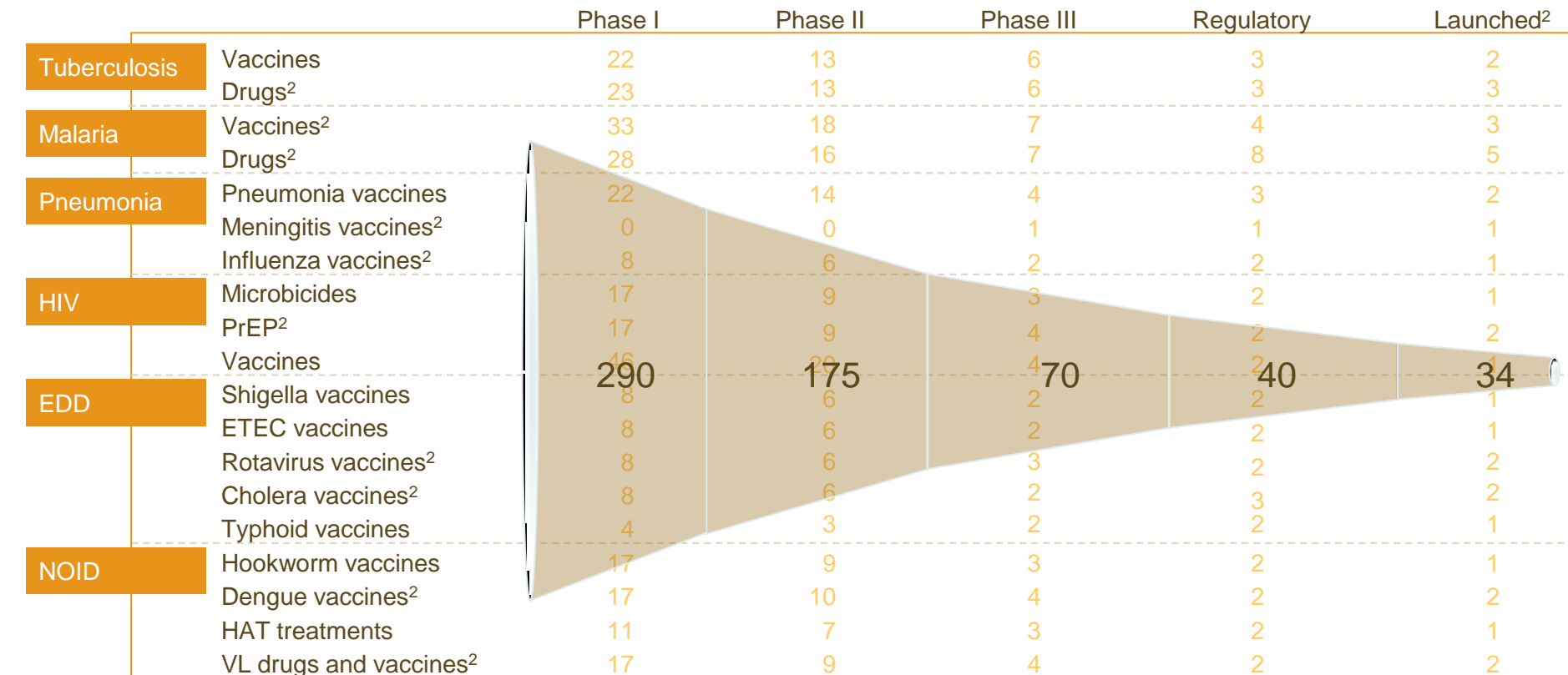
HIV	\$ 2,200,275,199	17%
Vaccine Delivery	\$ 1,863,483,538	14%
Malaria	\$ 1,660,326,554	13%
Advocacy	\$ 1,195,824,574	9%
Neglected Diseases	\$ 986,052,620	7%
Tuberculosis	\$ 886,991,353	7%
Maternal, Neonatal, & Child Health	\$ 830,793,255	6%
Polio	\$ 815,622,746	6%
Family Planning	\$ 561,438,286	4%
Discovery	\$ 490,258,201	4%
Pneumonia	\$ 474,450,398	4%
Nutrition	\$ 377,710,368	3%
Diarrheal and Enteric Diseases	\$ 374,108,686	3%
Special Initiatives	\$ 303,029,362	2%
Tobacco	\$ 95,743,839	1%
TOTAL	\$ 13 BN	100%

Focus on Results: Candidates in Development supported by Gates Foundation Investments

Disease Area	Candidates in Development
HIV vaccines	6
Other HIV preventives	5
Malaria vaccines	6
Malaria therapeutics	5
Tuberculosis vaccines	5
TB therapeutics	3
Pneumonia vaccines	8
Diarrhea vaccines	7
Neglected Disease vaccines	6
Neglected Disease therapeutics	6
Diagnostics	11

Significant investment is required by donors & development partners to bring products to market in key disease areas

Theoretical end-to-end portfolio required to ensure a launch against each product development goal by 2020^{1,2}

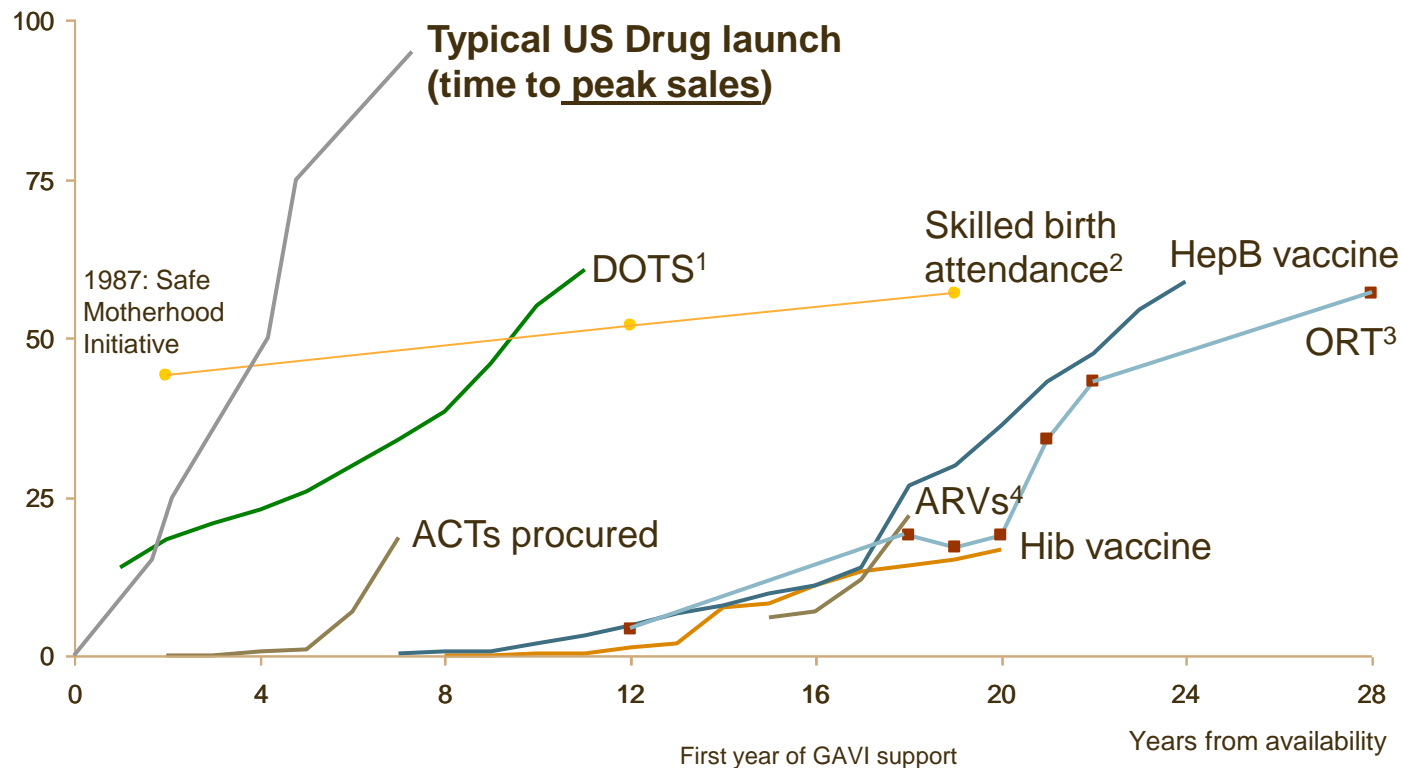


Vaccine Delivery:
Investments to support
vaccine access

Slow uptake and low coverage of critical health interventions drive the global burden of disease

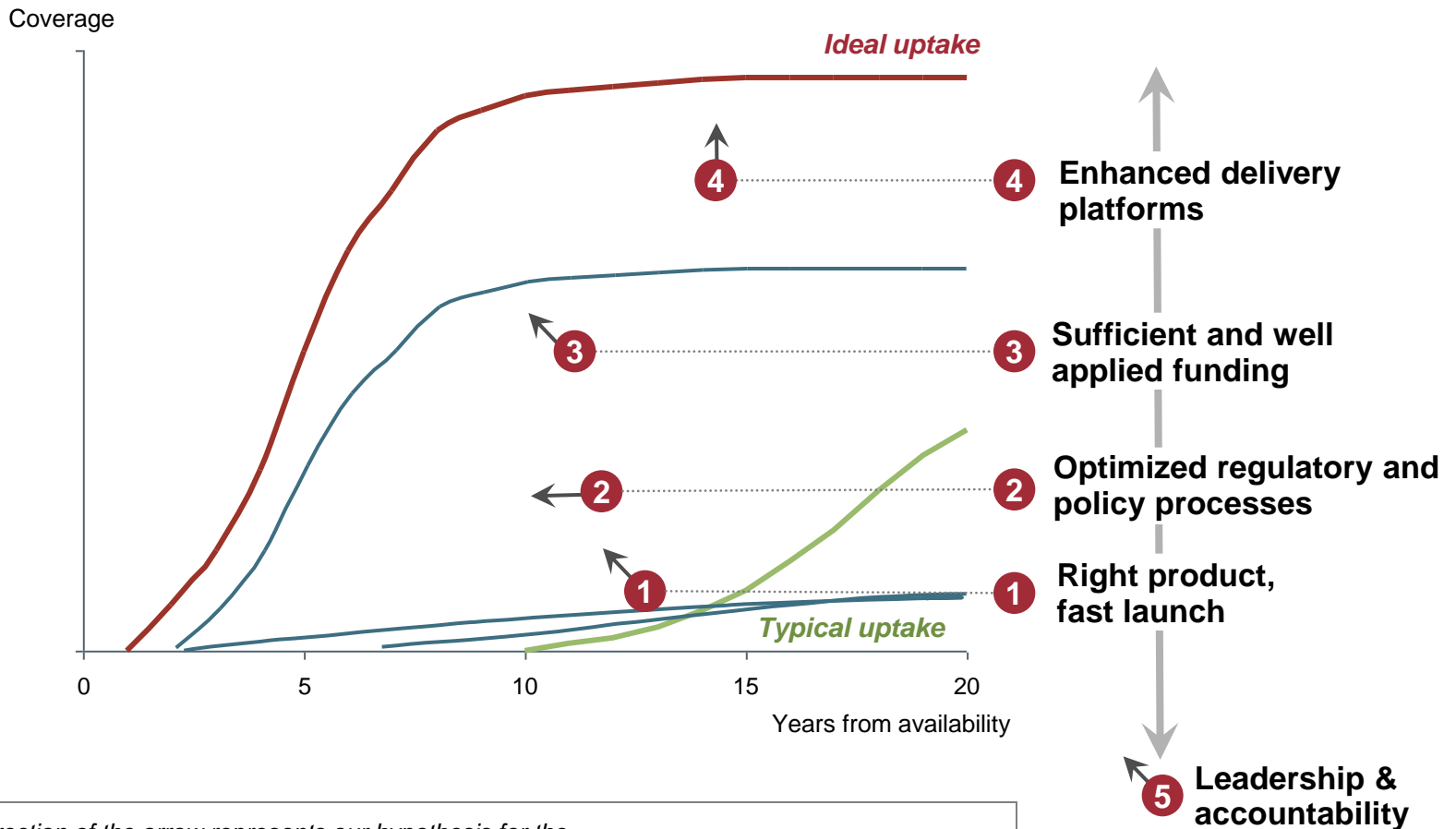
Gaps in coverage fall disproportionately on the poor, and amplify inequity

% coverage of health intervention in low and middle income countries



1. DOTS represents a new model to deliver older technologies (drugs), so uptake is faster than completely new interventions 2. Skilled birth attendance is an ancient intervention, but its introduction is measured from 1987, when the Safe Motherhood Initiative was launched. Skilled birth attendance is considerably lower in Sub-Saharan Africa, where it is only 44%.3. Average of 49 countries reporting ORS rates 1999-2005, weighted by population under 15 years old 4. NRTIs were first approved in 1987, which is used as the start date. NNRTIs were approved in 1997 while PIs were approved in 1995. 6 million people are estimated to need ARVs. 5. ACT coverage is overstated as numbers represent only those procured, not those properly administered. Source: WHO/UNICEF; World Bank; BCG analysis

Accelerating Access to Vaccines – Our Theory of Change



Direction of the arrow represents our hypothesis for the directional impact of addressing each need

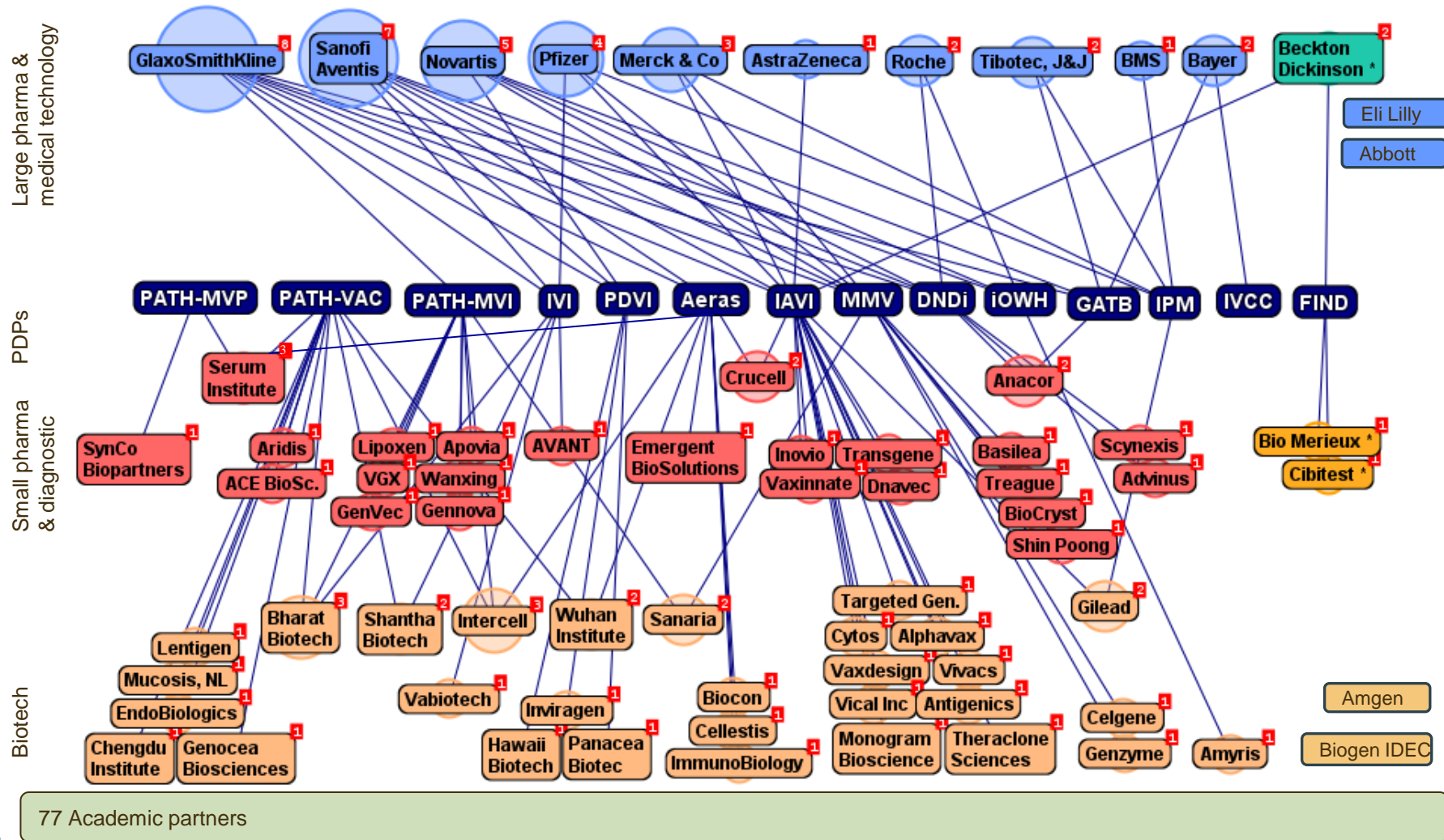
Curves meant to be representative and are based generally on our understanding from case studies. The shape of the curve and impact of each need varies by intervention and geography

Improving Access: Illustrative Vaccine Delivery Investments

Product Profile	<ul style="list-style-type: none"> TechNet Consultation/TechNet Continuum Development of generic Target Product Profiles 	WHO PATH/WHO
Research & Development	<ul style="list-style-type: none"> Thermostable Vaccines Disposable-Cartridge Jet Injector for Vaccine Delivery 	PATH PATH
Building Evidence Base Global Regulatory and Policy	<ul style="list-style-type: none"> Assess disease burden of Typhoid in Africa Cholera surveillance in Africa Actions to accelerate uptake of cholera vaccines in India Barriers to access in middle income countries Prequalification & Improved capacity of NRAs 	IVI AMP IVI WHO WHO
Region / Country Policies and Decision-Making	<ul style="list-style-type: none"> National processes to enhance evidence-informed decision ProVac Initiative – cost effectiveness capacity building Assessing impact of new product adoption on health systems Cholera vaccine introduction in India 	AMP PAHO LSHTM IVI
Financing	<ul style="list-style-type: none"> GAVI Advocacy Project for Sustainable Immunization Financing 	Sabin
Supply Procurement and Distribution	<ul style="list-style-type: none"> Immunization Systems and Technologies for Tomorrow Vaccine Supply analyses and supply strategy development 	PATH GAVI

Donors Depend on PDPs and a Constellation of Biopharmaceutical & Academic Partners

Snapshot of network map of PDP R&D partners based on data provided by PDPs, July 2009

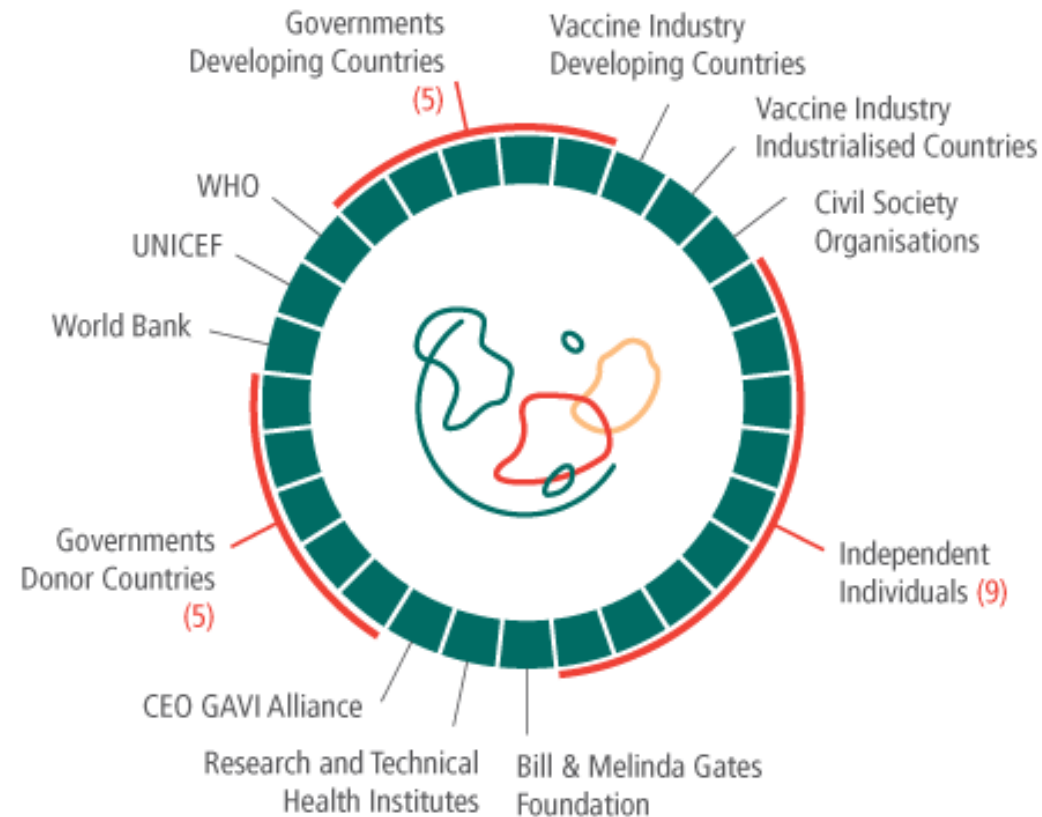


Note: Size of halo and number in red represent number of partner's connection to PDPs.

Source: BCG analysis, PDP business development contacts, PDP websites

GAVI Alliance – A Snapshot

- Founded in 2000 as a public private partnership
- Initial infusion of \$750M from the Gates Foundation; now has 17 principal donors
- Hosted initially by UNICEF, now a private Swiss Foundation
- Has raised almost \$6 billion to date; \$2 billion through the International Finance Facility for Immunization (IFFIm)



¹ Approximately 14 currently-eligible countries are expected to have GNI per capita > \$1500 when 2009 data is released in July 2010.

These countries will lose their eligibility for GAVI support. The \$2.6 billion gap assumes this reduction in country support. © 2010 Bill & Melinda Gates Foundation

Vaccine access in public markets

Key Public Markets for Vaccines

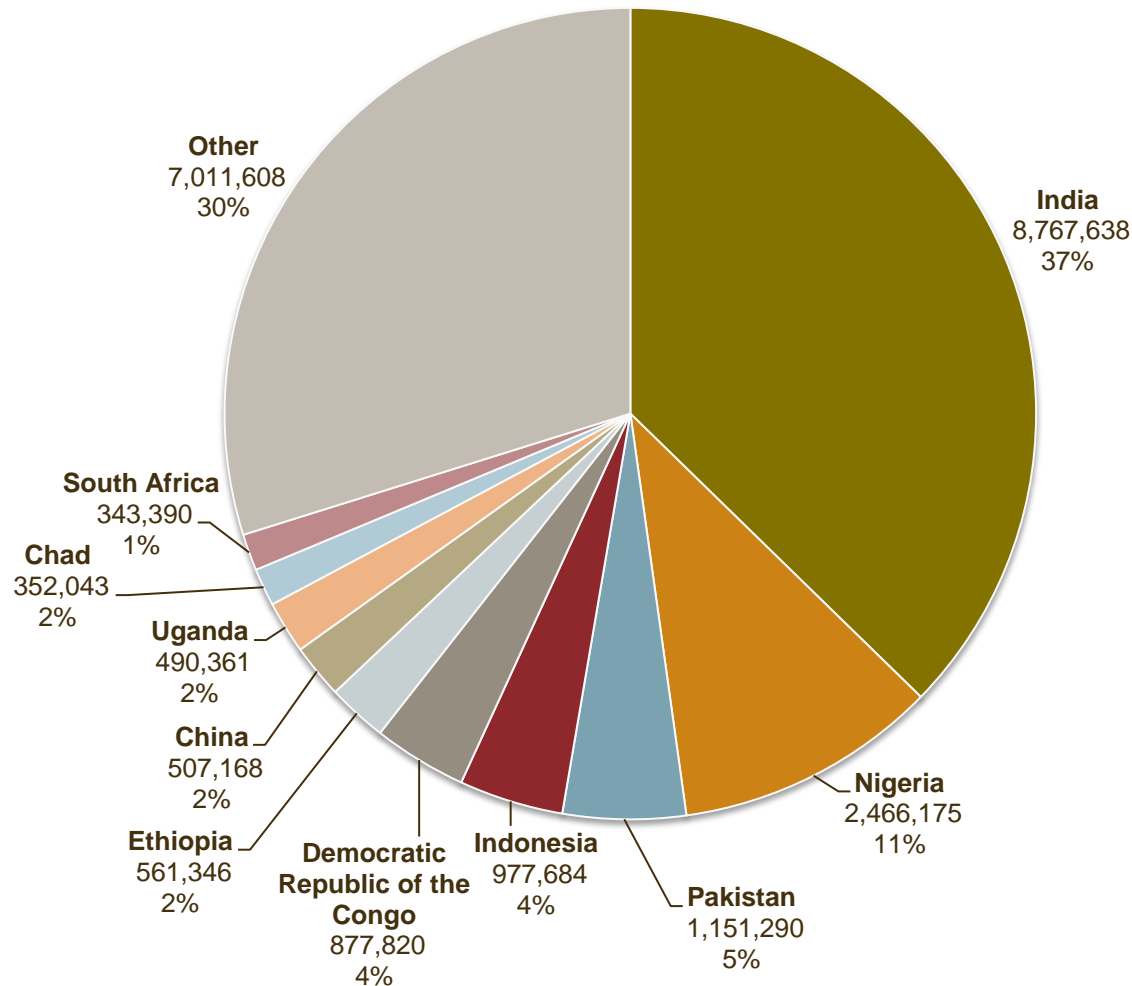
Key Countries

- 1. India – emerging domestic market, strong export capability**
- 2. China – strong domestic market, limited role in exporting vaccines**
- 3. Brazil – strong domestic market, limited role in exporting vaccines**

Purchasing Channels (WHO prequalification required)

- 1. GAVI – income based inclusion of poorest countries, UNICEF procurement.**
- 2. PAHO – regional purchasing through revolving fund**

Total number and global share of unimmunized children by country, based on DTP3 coverage (total 23MM)



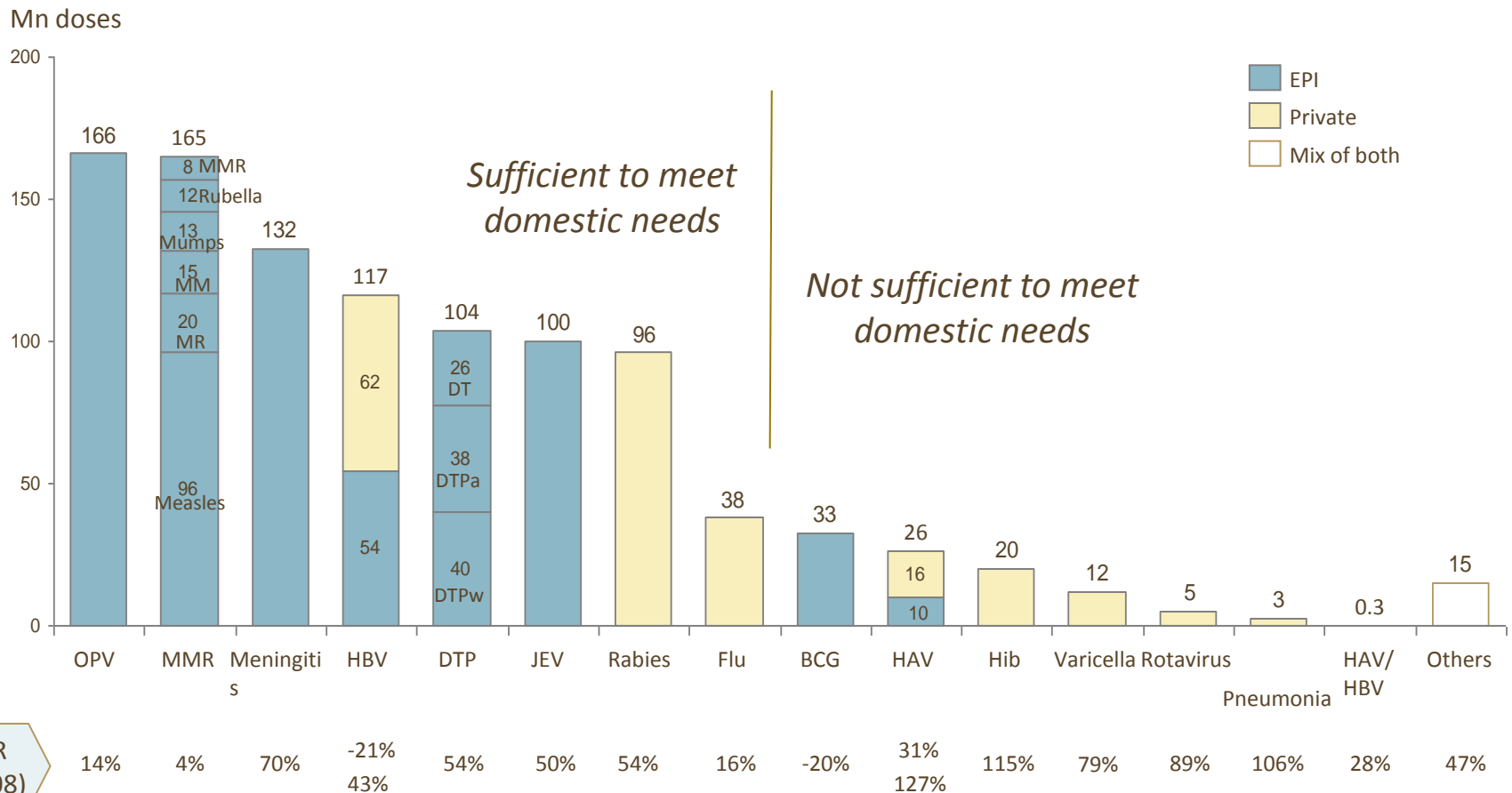
China: Overview of An Emerging Vaccine Market

China's vaccine industry is well-developed

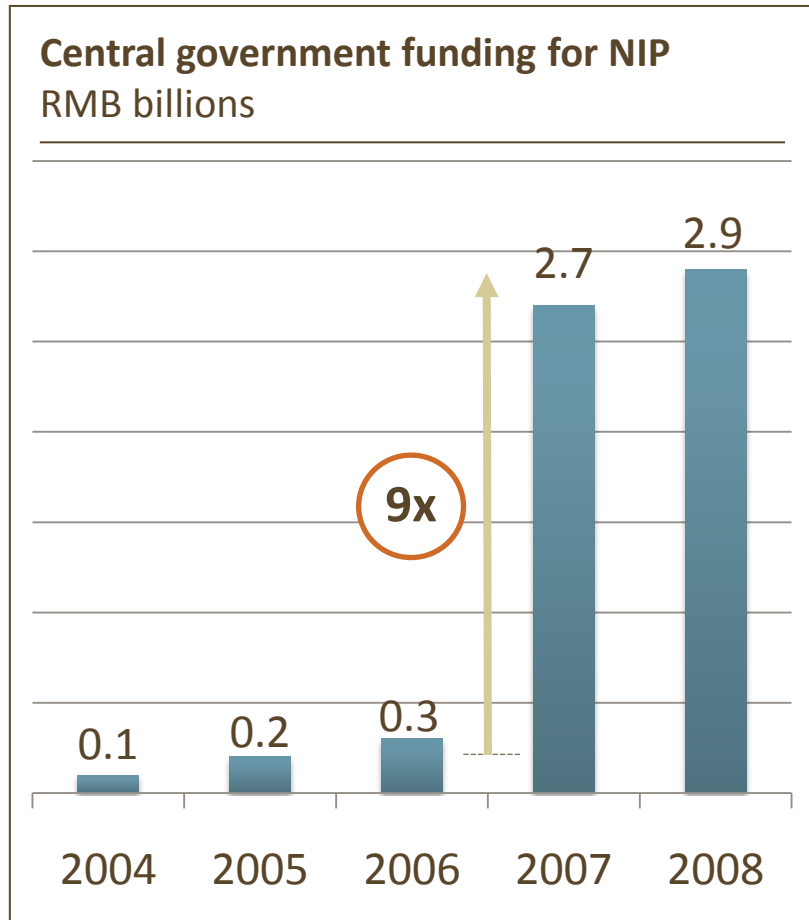
State-owned/ holding companies	Private enterprises or partially state-owned	MNC Players
8	30+	5
CNBG is largest vaccine player, with <u>60%</u> of the total market share (<u>90%</u> of Category A and <u>40%</u> of Category B vaccine markets).	High operation flexibility, varying R&D capacity, operations maintained in particular areas	Strong marketing, emphasis on market incubation & branding, high prices. Sanofi Pasteur and GSK are the biggest players.
<div> <div>Vigoo</div> <div>VIGOO. 微谷 BIOLOGICAL</div> </div> <div> <div>Tiantan</div> <div>天坛生物 TIANYUAN BIO</div> </div> <div> <div>BIBP</div> <div>BTBP</div> </div> <div> <div>SIBP</div> <div>天元生物</div> </div> <div> <div>LIBP</div> <div>CCBP</div> </div> <div> <div>WIBP</div> <div>CDIBP</div> </div>	<div> <div>延申生物</div> <div>Ealong Biotech</div> </div> <div> <div>TIANYUAN</div> <div>BIO-PHARMA 天元生物</div> </div> <div> <div>ChangSheng</div> <div>长生</div> </div> <div> <div>Aleph</div> <div>aleph</div> </div> <div> <div>HUALAN</div> <div>华兰</div> </div> <div> <div>WALVAX</div> <div>卫尔信</div> </div> <div> <div>sinovac</div> <div>北京科兴</div> </div>	<div> <div>gsk</div> <div>GlaxoSmithKline 葛兰素史克</div> </div> <div> <div>sanofi pasteur</div> <div>The vaccines business of sanofi-aventis Group</div> </div> <div> <div>Wyeth</div> <div>诺华</div> </div> <div> <div>NOVARTIS</div> <div>诺华</div> </div> <div> <div>MSD</div> <div>默沙东</div> </div>
Chinese vaccine producers have marketed 49 vaccines and produced 800 million vaccine doses annually to fight 26 infectious diseases.		
Lower R&D		Higher R&D

Chinese manufacturers produce around two dozen types of vaccines

China annual vaccine volume by product type (2008)



China: Central government funding for Expanded Immunization Program (EPI) significantly increased



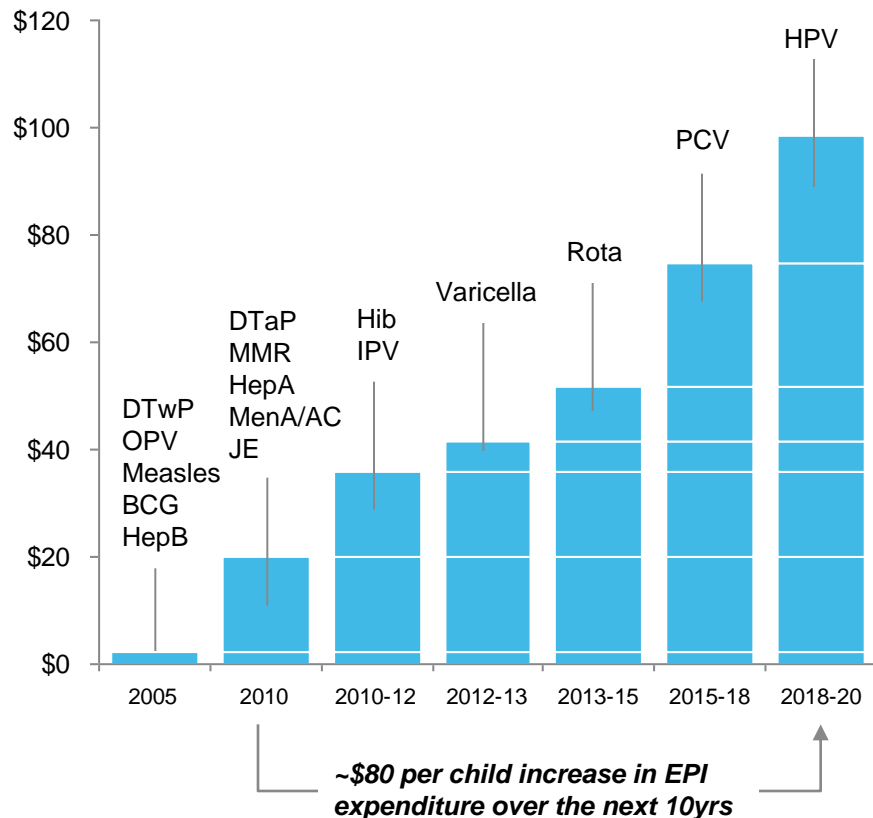
- NIP covering 14 diseases - up from 7 before 2007
- Significant increase in investment to ensure the implementation of the NIP expansion:
 - 2.0 Billion RMB for the expanded Category A vaccines purchase
 - Trained 420,000 inoculation professionals at all levels
 - Invested ~1 Billion RMB for increased cold chain distribution capabilities

Local Public Market

Public market adoption in China is expected to grow at 4x the rate of that in India (on a value basis).

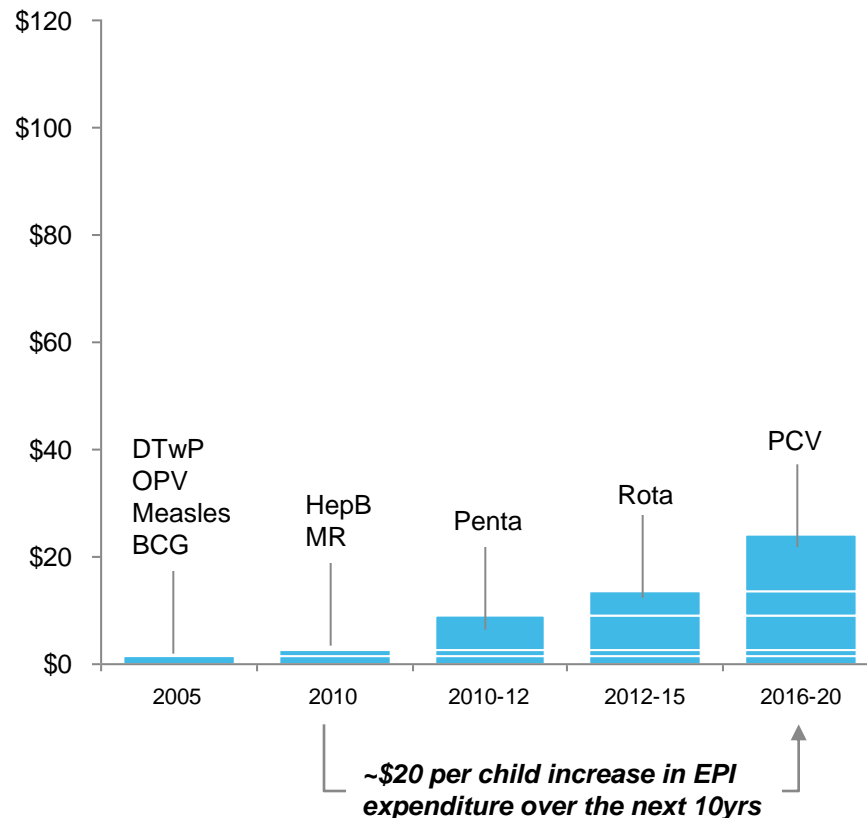
China EPI Program Projections

Estimated full immunization cost per child¹



India EPI Program Projections

Estimated full immunization cost per child²



1. 2009 Tender information, Hainan, Shanxi and Hunan Province for existing vaccines; 2/3 current PAHO pricing assumed for new vaccines

2. 2009 UNICEF pricing for existing vaccines; Penta, Rota, and PCV based off of GAVI investment case

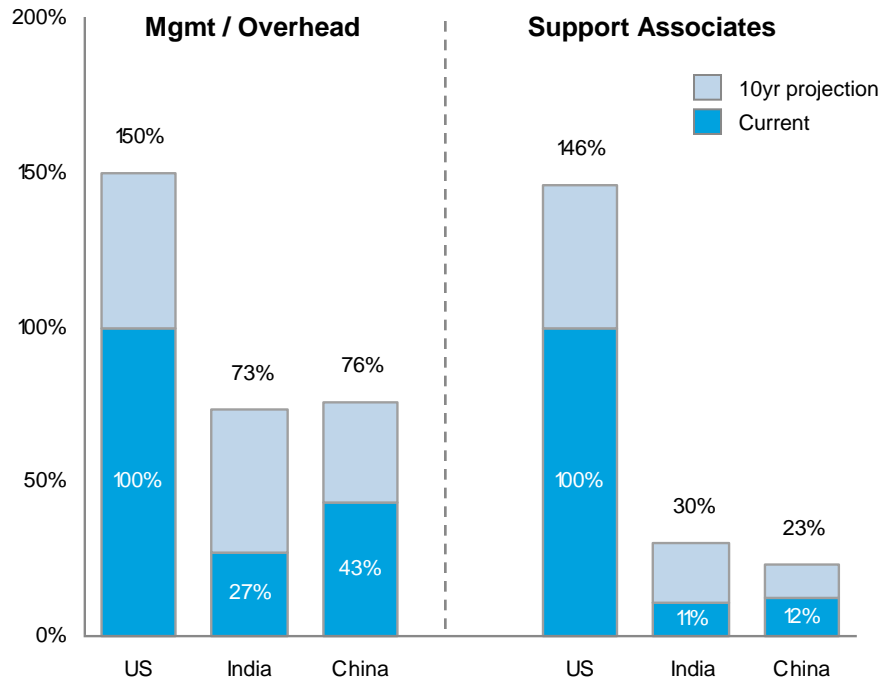
Source: EPI adoption timing based off in market interviews

Are Labor and Facility Costs Competitive?

The underlying costs of production in China are similar to India and significantly less than developed world manufacturers

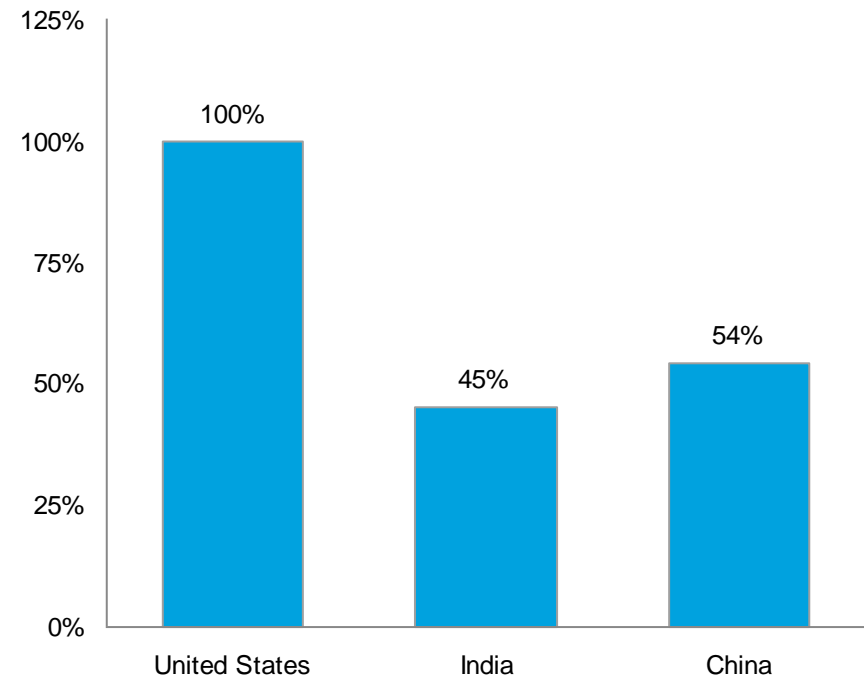
Salaried Indexed to Current US Salaries¹

Index to Current US Salaries



Facility cost indexed to current US costs²

Index to Current US Construction Costs



Scenario: Oliver Wyman analysis

1. Mercer Global Pay Summary 2002, 2005, 2008; Assumes constant exchange rates

2. "International Construction Cost Index." Faithful + Gould with RS Means, Sept-Oct. 2007

Gates Foundation Investments in China: PATH:CNBG Partnership on vaccines

Japanese Encephalitis

- 2005 WHO acknowledges excellent efficacy and safety of JEV developed at Chengdu IBP
- 2007 PATH supports building a new production facility in compliance of WHO GMP
- 2010 On track to apply for WHO prequalification in 2010

Rotavirus

- 2007 PATH signs agreement with Wuhan IBP for Rotavirus vaccine development, licensed from NIH
- 2008 PATH/WHO GMP expert advise on Wuhan GMP improvement and gives training on WHO GMP
- 2010 PATH and WHO experts audit Rotavirus project (validation, QC, documentation system), agree on next steps and timetable

Pneumococcal

- 2009 PATH partners with Chengdu IBP to accelerate development for multivalent pneumococcal conjugate vaccine for developing countries

Brief Overview of Access & Tiered Pricing

Access to Vaccines in Public Markets

- 1. Despite strong support and innovation from donors, manufacturers and other stakeholders, vaccine access for lowest-income markets continues to be a significant challenge despite compelling cost-effectiveness data**
- 2. Improving speed and depth of access will require enhancement of current approaches and commitments, as well as novel approaches –**

Examples of Bill & Melinda Gates Foundation activities

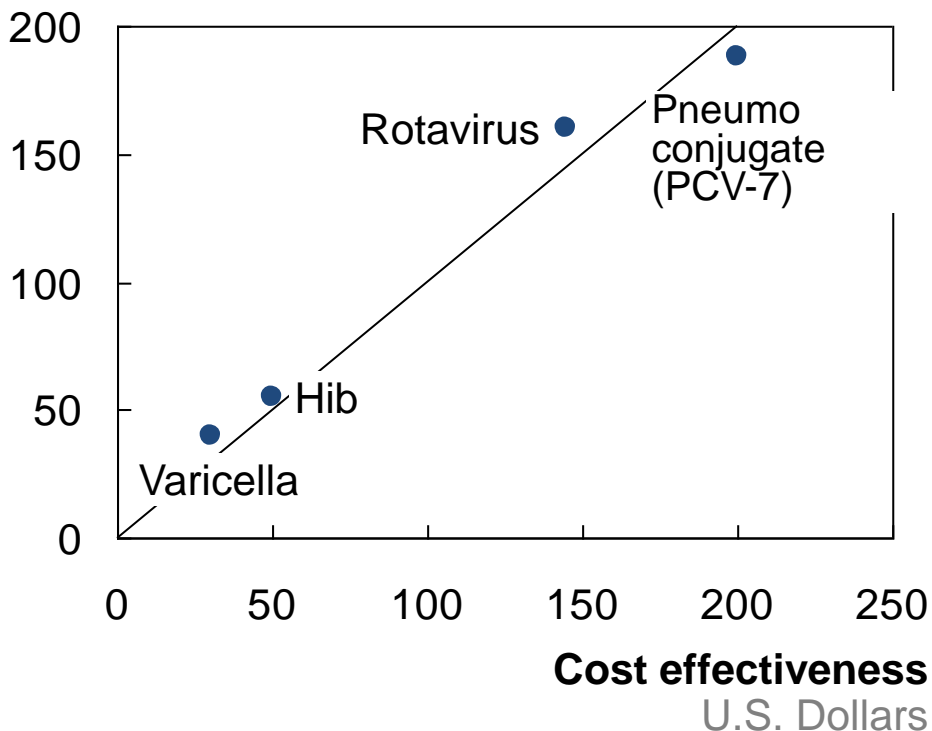
- **“Pull” - Role as donor for AMC, GAVI and grants to WHO to support prequalification**
- **“Push” - Continued investment in product development through PATH, other PDPs**
- **Global access provisions for lowest income markets as condition of funding**
- **Alternative investment models – “leveraging the balance sheet”, risk-sharing**
- **Access-based pricing models for vaccines as a component of overall access strategy**
- **Decade of Vaccines Announcement (advocacy, increased funding)**

In high income markets, price is usually driven primarily by cost effectiveness

US EXAMPLE
















**Actual launch price per course
(first product to market)**

U.S. Dollars



- Buyer reservation price, driven primarily by vaccine cost effectiveness, tends to be primary determinant of launch price in many high-income markets
- Manufacturers have substantial pricing power in early years when there is no/little competition
- Pricing dynamics tend to be different in low-income / GAVI markets

Tiered pricing for pneumococcal vaccines: AMC \$3.50 tail price reflects a large discount vs. other markets

Pneumo vaccine prices		GAVI discount	
Price per dose, USD		Percent	
Market	Product	Price per dose	
	 	3.50	-
		17 ¹	79
		22	83
		52-60	93
		~65 ²	95
		91 ³	96
		~125 ⁴	97

- Prices in other markets range from ~\$17 to ~\$125 per dose
- Tail price agreed under AMC represents a reduction of 80-95% over other markets

1 Price announced to be the initial price paid by Brazilian government to support tech transfer agreement between GSK and Fiocruz Institute

2 Based on Indian private market price of Rs3000 and (1Rs to 0.022 USD)

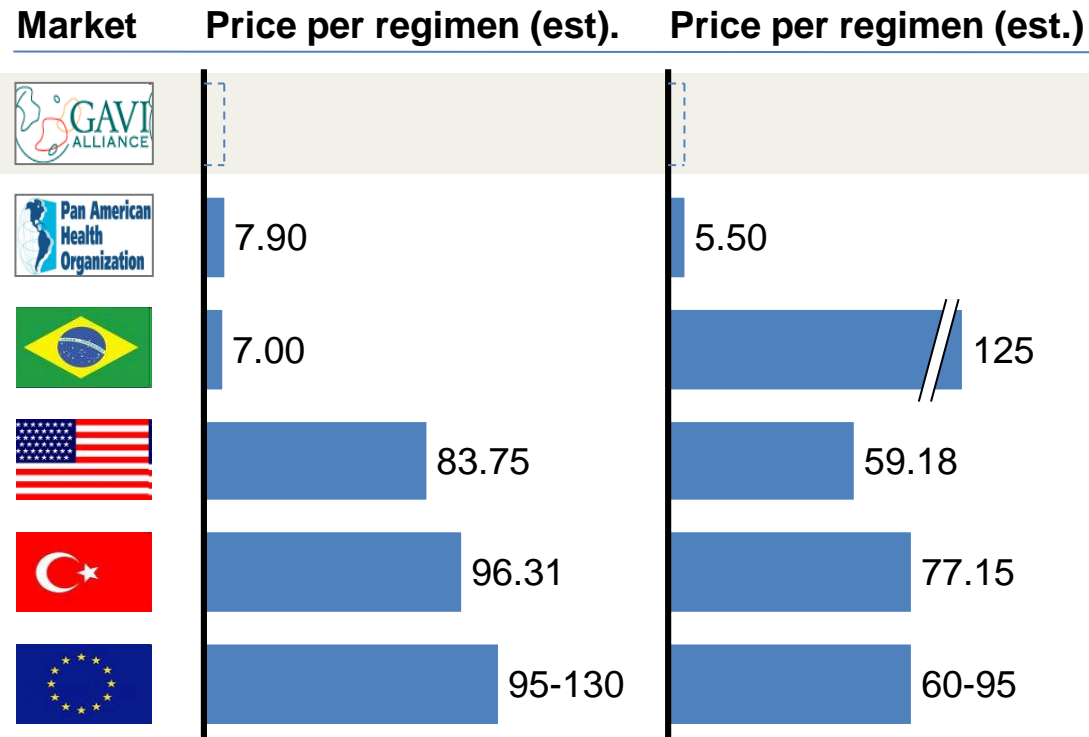
3 \$91 is CDC price for public market. Private sector price is \$108

4 Price for Pfizer's Prevnar-7 in Chinese private market (860 Yuan at 0.146 USD per Yuan)

Despite early indication of tiered pricing, access for rotavirus vaccines is likely to be challenging

Rotavirus vaccine prices (public and private market prices)

Price per course, USD

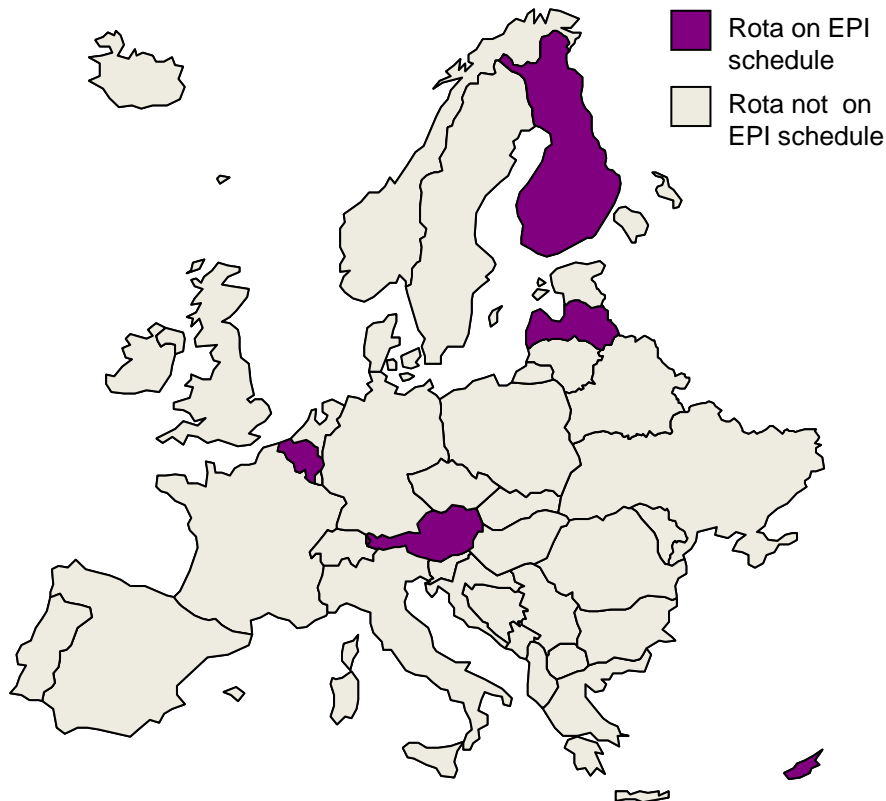


- Significant tiering of prices between high- and low-income markets
- No AMC-like mechanism
- Recent data from African countries will support introduction / decision-making
- Only two suppliers to date
- Uptake and usage may be limited by cold chain capacity
- No UNICEF tenders for rotavirus vaccine to date

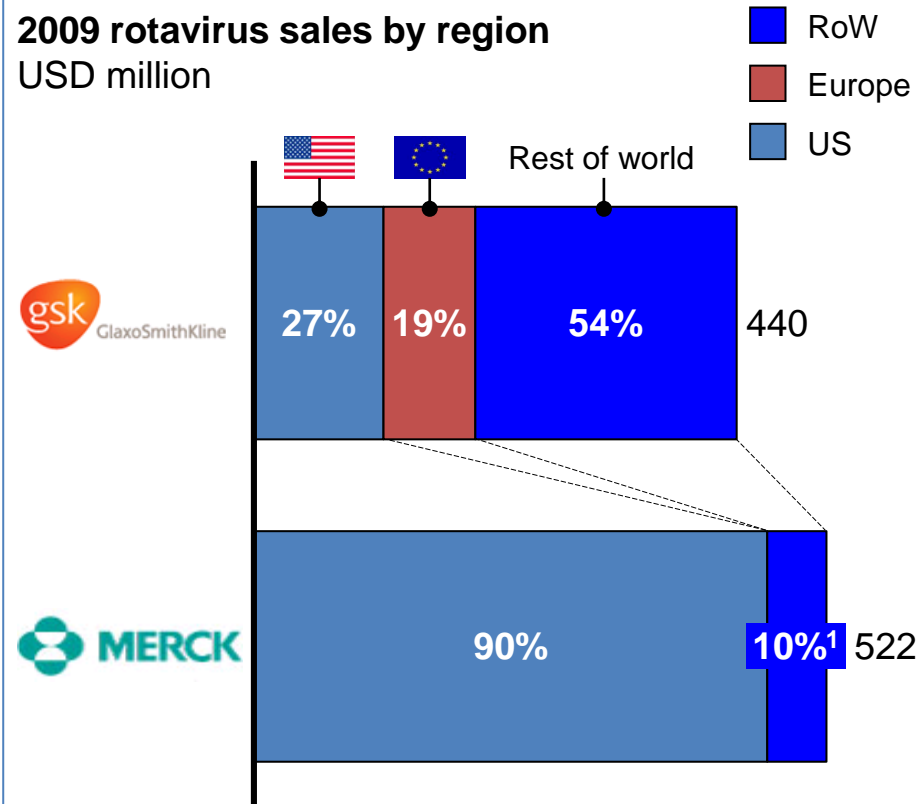
United States accounts for the majority of high-income demand with low adoption among European countries

To date, only six European countries have added rota to their immunization schedule...

...so the majority of rota sales are currently in the US and middle-income markets



2009 rotavirus sales by region
USD million



1 May include some European sales as Merck does not report European sales separately from other non-US sales

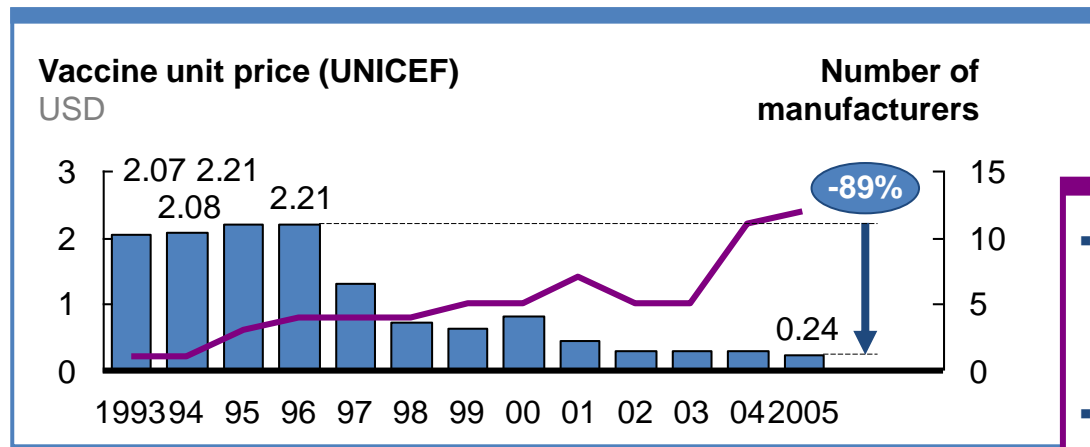
Share Prices of Major Vaccine Manufacturers 2000-2010



The Future for Public Vaccine Markets

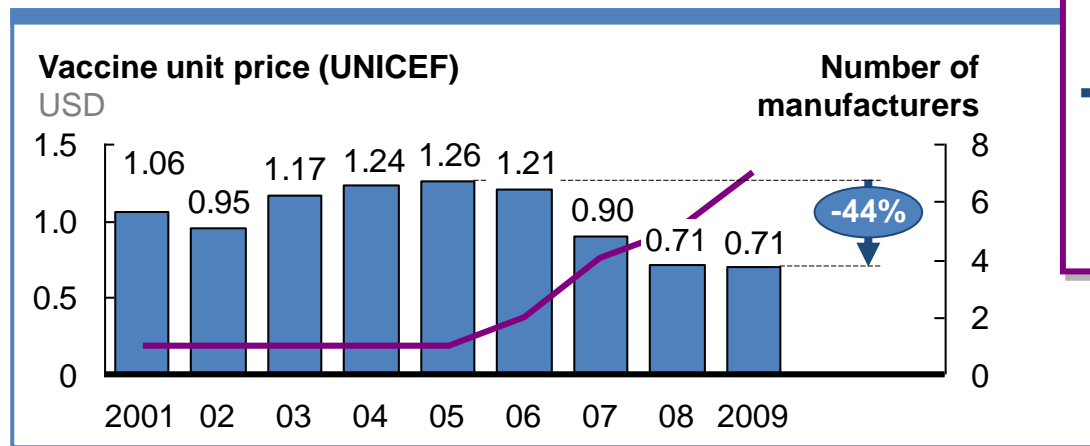
Rapid price declines are possible in competitive markets

Global price changes in monovalent hepatitis B vaccine, 1993-05



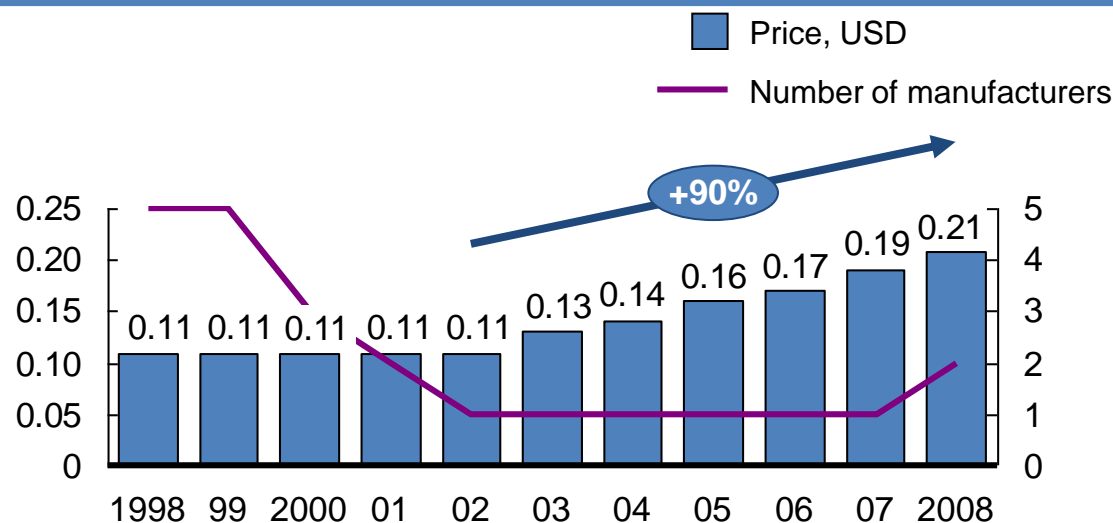
- Case examples from other UNICEF vaccines suggest that increases in competition can result in substantial, rapid price reductions from peak
- These are not perfect analogies for penta, since numerous differences exist between the various markets (e.g., significantly simpler manufacturing process for HepB)
- However, similar overall market dynamics are predicted for penta going forward so significant price reductions are likely

Global price changes in tetraivalent DTP-HB vaccine, 2001-09



Excessive price declines may drive suppliers to exit affecting supply security and long-term prices

Measles case study illustrates how aggressive short-term price declines may undermine supply security and long-term pricing



- Dropping prices and a shortage of freeze-drying capacity in the late 1990s caused the **exit of many measles manufacturers**
- Since then, **prices have nearly doubled** from the floor achieved during more competitive dynamics
- UNICEF has also become more **exposed to supply disruptions**, since nearly 80% of total volume comes from a single supplier

- **Pentavalent vaccine market is likely at a critical tipping point** with substantial price drops likely imminent
- It is therefore **important to consider how to balance short-term and long-term objectives** and avoid the outcome seen in the measles market

1 Number of manufacturers representing 75% of offered supply

A Call for the Decade of Vaccines

- Call to donors, governments, private sector to advance global immunization goals
- Committed \$10 billion over 10 years
- Funding for vaccine discovery, development, delivery
- Potential to save 8 million child lives by 2020 with better access to existing vaccines
- Gates Foundation contribution is insufficient to address global immunization needs – others must join us!

